REMARKS/ARGUMENTS

Status of the Claims

New claims 25-132 are submitted herewith for examination on their merits. Claims 25-78 are drawn to methods for providing phosphorus for a plant. Claims 79-132 are drawn to methods for making a phosphorus fertilizer.

A. The Amount of Phosphorus Equivalent to P_2O_5 in kg/L Percentage

Pending claims 37-66 and 91-120 recite the amount of a phosphorus-containing species in a concentrated fertilizer by way of reference to the phosphorus amount equivalent to P_2O_5 in kg/L. Although P_2O_5 does not actually exist in the concentrated fertilizers of the present invention, it is used as a reference measurement of phosphorus for historic reasons. The fertilizers of modern days are still labeled to indicate the concentration of nitrogen-phosphorus-potassium according to the "N-P-K" nomenclature.

As set forth by Kirk-Othmer,

> By convention, numerical expression of the available nutrient content of a fertilizer is by three successive numbers that represent the percent available of N, P_2O_5, and K_2O, respectively.

(Kirk-Othmer, *Encyclopedia of Chemical Technology*, 4th. Ed., 1993, vol. 10, p. 437, John Wiley & Sons, New York).

The examples provided in the specification of the present application use the N-P-K nomenclature, referring to N, P_2O_5, and K_2O concentrations in a liquid fertilization formulation of weight (kg) / volume (L) percentage. As attested to in the declaration by John Peterson, an analytical chemist of over 30 years experience (see Exhibit A), when a known weight of H_3PO_3 is added into a liquid fertilizer in the final volume of one gallon, one skilled in the art can immediately calculate the amount of phosphorus (in the form of H_3PO_3) in weight / volume (kg/L), which can in turn be easily converted into the amount of phosphorus in the form of P_2O_5 concentration in kg/L. It is therefore obvious to one skilled in the art that the numbers,

such as the 40 of the 0-40-0 in Examples 1-2 and the 30 of the 0-30-0 or 0-30-30 in Examples 3-9, represent P_2O_5 concentrations in kg/L percentage.

For example, in Example 2, 3.86 lbs of H_3PO_3 and 0.5 lb of citric acid are made into one gallon of liquid fertilizer. The weight / volume (kg/L) concentration of H_3PO_3 is thus:

(3.86 lbs x 0.454 kg/lb) ÷ (1 gallon x 3.785 L/gallon) = 0. 46 (kg/L)

In order to convert concentration in the form of H_3PO_3 to concentration in the form of P_2O_5, one must begin with the molecular weight of these two molecules. The atomic weight for phosphorus is 30.97 grams per mole, hydrogen 1.01 g/mole, and oxygen 15.99 g/mole. The molecular weight for H_3PO_3 is thus 81.97 g/mole and P_2O_5 141.89 g/mole. Since there is one atom of phosphorus in every molecule of H_3PO_3 and there are two atoms of phosphorus in every molecule of P_2O_5, same amount of phosphorus exists in 1 mole of H_3PO_3 and ½ mole of P_2O_5, i.e., in 81.97 grams of H_3PO_3 or 71.945 grams of P_2O_5. Thus, to convert a weight / volume concentration (H_3PO_3) into a weight / volume concentration (P_2O_5) the following calculation is necessary:

W/V (P_2O_5) = W/V (H_3PO_3) x 71.945 ÷ 81.97

When W/V (H_3PO_3) = 0.46 kg/L, W/V (P_2O_5) = 0.46 x 71.945 ÷ 81.97 = **0.40 (kg/L)**, or **40% (kg/L)**. This percentage corresponds to the label of "0-40-0 fertilizer."

Using Example 6 to illustrate the same point, 2.89 lbs H_3PO_3, 2.99 lbs KOH, and 0.84 lb citric acid are included in a one gallon liquid fertilizer.

W/V (P_2O_5) = W/V (H_3PO_3) x 71.945 ÷ 81.97
= (2.89 lbs x 0.454 kg/lb) ÷ (1 gallon x 3.785 L/gallon) x 71.945 ÷ 81.97
= **0.30 (kg/L)** or **30% (kg/L)**

This percentage again corresponds to the label of "0-30-30 fertilizer."

These calculations indicate that the phosphorus amounts equivalent to P_2O_5 in kg/L recited by pending claims are properly supported by the specification. As John Peterson

states in his declaration, it is well known in the art how to convert a weight / volume concentration of H_3PO_3 into an equivalent P_2O_5 weight / volume concentration. The same principle allows similar calculations for conversions between P_2O_5 weight / volume concentration and weight / volume concentration of any given phosphorus-containing species. The amount of a particular phosphorus-containing species can thus be determined in a particular fertilizer.

In summary, one skilled in the art can recognize the liquid fertilizer formulation as set forth in the examples, understand the meaning of such formulation, determine the metes and bounds of the invention as claimed, and know how to make a claimed composition based on a P_2O_5 weight / volume concentration.

B. Phosphorus-Containing Species

Claims 25-78 are directed to a general method, and five more specific methods, of providing phosphorus to a plant. In the general method, water, at least one organic acid or salt thereof, and a formulation comprising at least one phosphorous-containing acid or salt thereof are mixed and then applied to a plant. In the first specific method, the formulation is diluted with water, mixed with at least one organic acid or salt thereof, and the resulting phosphorus fertilizer is applied to a plant. In the second specific method, at least one organic acid or salt thereof is diluted with water, mixed with the formulation, and the resulting phosphorus fertilizer is applied to a plant. In the third specific method, the formulation is diluted with water, at least one organic acid or salt thereof is diluted with water, the two are mixed, and the resulting phosphorus fertilizer is applied to a plant. In the fourth specific method, the phosphorus fertilizer has a pH of 5.0 to 7.0. In the fifth specific method, water, at least one organic acid or salt thereof, and a formulation comprising at least one phosphorous-containing acid or salt thereof are mixed, the pH of the phosphorus fertilizer is adjusted to between about 5.0 and about 7.0, and then applied to a plant.

Claims 79-132 are directed to a general method, and five more specific methods, of making a phosphorus fertilizer. In the general method, water, at least one organic acid or salt thereof, and a formulation comprising at least one phosphorous-containing acid or salt thereof

are mixed. In the first specific method, the formulation is diluted with water and mixed with at least one organic acid or salt thereof. In the second specific method, at least one organic acid or salt thereof is diluted with water and mixed with the formulation. In the third specific method, the formulation is diluted with water, at least one organic acid or salt thereof is diluted with water, and the two are mixed. In the fourth specific method, the phosphorus fertilizer has a pH of 5.0 to 7.0. In the fifth specific method, water, at least one organic acid or salt thereof, and a formulation comprising at least one phosphorous-containing acid or salt thereof are mixed and the pH of the phosphorus fertilizer is adjusted to between about 5.0 and about 7.0.

Support for the claims is found in the specification and claims of this and related applications. Support for "phosphorus fertilizer" in claims 25-42, 61-78, 79-96, and 115-132 is found from page 5, line 28 to page 6, line 3. Support for "phosphite fertilizer" in claims 43-54 and 97-108 is found from page 6, lines 14-19. Support for "formulation" in claims 25-132 is found in page 4, lines 20-22. The "substantially fully solubilized" limitation in claims 25-66 and 79-120 is found from page 6, line 27 to page 7, line 1. The "foliage-acceptable pH for phosphorus uptake/used for foliar application" limitations in claims 25-66 and 79-120 are found in page 7, lines 2-6. Support for claims 67-78 and 121-132 are found from page 9, line 12 to page 10, line 4, as well as in Example 2 in page 12, lines 3-8. Support for claims 26-27, 32-33, 38-39, 44-45, 50-51, 56-57, 62-63, 81-82, 86-87, 92-93, 98-99, 104-105, 110-111, and 116-117 is found in Example 1 from page 11, line 24 to page 12, line 2. Support for claims 28, 34, 40, 46, 52, 58, 64, 83, 88, 94, 100, 106, 112, and 118 is found in page 6, lines 16-19. Support for claims 29, 35, 41, 47, 53, 59, 65, 84, 89, 95, 101, 107, 113, and 119 is found in page 7, lines 4-5. Support for claims 30, 36, 42, 48, 54, 60, 66, 85, 90, 96, 102, 108, 114, and 120 is found in Example 3 in page 12, lines 9-17.

In view of the foregoing discussion, proper support is present in the specification for the newly added claims. The Examiner is respectfully requested to enter claims 25-132.

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 415-576-0200.

Respectfully submitted,

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